REMARKS

Claims 1-4, 6-11, 15, 22, and 24 are currently amended. Claims 5, 12, 14, and 25 are canceled without prejudice. Claims 26 and 27 are withdrawn. New claims 28 and 29 are added. Support for the amended claims and new claims is found in the application as filed, with no new matter being added.

Accordingly, claims 1-4, 6-11, 13, 15-24, and 26-29 are pending in this application. Reconsideration of the pending claims is respectfully requested in view of the following remarks.

Claim Objections

Claims 1 and 3 were objected to for minor informalities in the claim language. Applicant has made appropriate corrections to claims 1 and 3 as set forth above.

Double Patenting Rejection

Claims 1-25 were rejected for non-statutory obviousness-type double patenting rejection as being unpatentable over claims 1-13 of U.S. Patent No. 7,621,116. Applicant respectfully traverses.

As set forth above, additional limitations have been added to independent claims 1 and 22, which are not recited in claims 1-13 of U.S. Patent No. 7,621,116.

Accordingly, claims 1 and 22, as well as dependent claims 2-21 and 23-25 are not obvious with respect to claims 1-13 of U.S. Patent No. 7,621,116.

Applicant therefore respectfully requests that the rejection of claims 1-25 for non-statutory obviousness-type double patenting be withdrawn.

Rejections Under 35 U.S.C. § 112

Claim 3 was rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Applicant respectfully traverses.

The Examiner stated that the limitations "a first volumetric" and "a second volumetric" render claim 3 indefinite because it is unclear if the "a first volumetric device [and second]" in claim 3 are referring to the "a first volumetric device [and second]" of claim 1.

Applicant has amended claim 3 to delete the expressions "a first volumetric device" and "a second volumetric device" in view of the Examiner's comments.

Accordingly, amended claim 3 is not indefinite.

Applicant therefore respectfully requests that the rejection of claim 3 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Rejections Under 35 U.S.C. § 103

Claims 1-8 and 11-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,165,238 to Paul et al. (hereafter "Paul-1"), or in the alternative, over Paul-1 in view of U.S. Patent No. 4,825,827 to Yang (hereafter "Yang"). Applicant respectfully traverses.

It is respectfully submitted that the amended claims recite subject matter not taught or suggested in the cited references, either alone or in combination, for the reasons that follow.

Amended claim 1 recites an engine system, comprising:

a) a first transfer volumetric device fed from a compressor or from a turbocompressor, for *sequentially transferring controlled volumes of a compressed fluid such that the pressure of said compressed fluid introduced to and exiting said first volumetric device is substantially equal*;

b) at least one second volumetric device larger in volume than said first volumetric device; and

c) a combustor for providing continuous combustion, said combustor being disposed between said first volumetric device and said at least one second volumetric device, such that each of said second volumetric devices receives heated fluid from a corresponding combustor,

wherein said first transfer volumetric device is operable to prevent backflow of said heated fluid;

wherein, *during continuous flow of said compressed fluid from said first volumetric device to each of said at least one second volumetric devices, work is performed.*

There is no teaching or suggestion in the cited references, either alone or in combination, of all the limitations recited in claim 1. In particular, there is no teaching or suggestion of a first transfer volumetric device for "*sequentially transferring controlled volumes of a compressed fluid such that the pressure of said compressed fluid introduced to and exiting said first volumetric device is substantially equal*" and that "*during continuous flow of said compressed fluid from said first volumetric device to each of said at least one second volumetric devices, work is performed*" as recited in claim 1.

Paul-1 discloses (Fig. 2) a heat engine that includes a first rotary unit 80 for gas compression which is fed from a turbocharger 90 and a second rotary unit 82 for gas expansion. A combustor 78 for transferring thermal energy to the motive gas is disposed between the first rotary unit 80 and the second rotary unit 82. A one-way outlet automotive valve 114 for preventing backflow of the motive gas is opened when actuated by the compressed motive gas, to allow passage to the combustor 78.

The first rotary unit 80 of Paul-1 is not a transfer volumetric device in which "*the pressure of said fluid introduced to and exiting said first volumetric device is substantially equal*" as recited in claim 1. Rather, the first rotary unit 80 of Paul-1 is a compression unit. The pressure of the motive gas is increased since the rotor of the first rotary unit 80 diminishes the volume of the compression chamber 84 while the automotive valve 114 is closed.

In addition, by employing the one-way valve 114, the motive fluid is not necessarily transferred in each stage of the positive displacement cycle of Paul-1, depending on the operating conditions of the flow. Thus, there is no teaching in Paul-1 that "*during continuous flow of said compressed fluid from said first volumetric device to each of said at least one second volumetric devices, work is performed*" as recited in claim 1.

The configuration of the engine system defined in present claim 1, by which work is performed as the compressed fluid continuously flows from the first volumetric device to the second volumetric device, is advantageous in that it may be operated at a variable load and speed by utilizing the relatively high remaining energy available within the fluid discharged from the second volumetric device. The relatively high remaining energy results from the corresponding relatively high static pressure produced within the volume between the first and second volumetric devices by the combustor. Consequently, the present engine system is suitable, for example, for a motor vehicle propulsion system having a torque converter, rotational direction controller and transmission, which are powered by the heated discharge from the second volumetric device, or for a turbofan engine system.

In contrast, work can be performed by the engine of Paul-1 only during a compression sector when the one-way valve is closed. The engine system defined by present claim 1, however, can perform work throughout the 360 degree rotation of the rotors of the first and the at least one second volumetric devices.

If the pressure of the heated fluid within the combustor 78 of Paul-1 were greater than the pressure of the fluid delivered by the first rotary unit 80, such as when a relatively large amount of fuel is injected to the combustor and the heat engine is subjected to a large load, the pressure within the second rotary unit 82 is liable to become higher than the pressure within the first rotary unit 80 even at maximum opening of the intake control plugs 102 and 104. The one-way valve 114 in such a situation would be forced to remain closed, causing the heat engine to stall and the generation of power to be discontinued. Although Paul-1 suggests correcting this deficiency by separating the units 80, 82 and bypassing the motive gas through flow control valves 130, this solution may suffice to ensure that the heat engine will continue to rotate; however, the power output and torque generated by the heat engine will be negatively influenced. Due to the use of one-way valves and the frequent change in flow path and flow conditions, the flow of motive gas through the combustor will be unstable and will therefore lead to unstable combustion in the engine of Paul-1.

Due to the aforementioned problems of stalling, low power output, and unstable combustion resulting from the use of one-way 114, the actual operating conditions of the heat engine of Paul-1 will be such that the working pressure within the second rotary unit 82 will be less than that within the first rotary unit 80.

Yang discloses a rotary-type heat engine that has two-stage working chambers combined closely in series, wherein one chamber is small and the other is large. Each working chamber has a pair of circumferential piston-like rotors that are connected to the other by a small gas passageway. When the heat engine operates as a compressor, the port of the large chamber is the inlet and the port of the small chamber is the outlet, while the small rotor prevents backflow. When serving as a power shaft generator, the engine is oppositely oriented such that the inlet port is the small chamber and is equipped with fuel injection nozzles. Air is further compressed and the injected fuel is ignited in the small chamber, superheating the gases so that when expanded in the large chamber shaft power is generated.

The heat engine of Yang, when serving as a power shaft generator, fails to teach that the small chamber is a transfer volumetric device in which "*the pressure of said fluid introduced to and exiting said first volumetric device is substantially equal*" as recited in claim 1. Since fuel is injected and ignited in the small chamber of Yang, the gas is heated and pressurized. Thus, the pressure of the fluid introduced to and exiting the small chamber of Yang is <u>not</u> substantially equal.

Accordingly, even if the teachings of Paul-1 and Yang are combined as proposed by the Examiner, not all the limitations of claim 1 are met.

Hence, claim 1 would not have been obvious over the cited references.

As claims 2-8 and 11-16 depend from claim 1 and include all the limitations of claim 1, claims 2-8 and 11-16 would also not have been obvious over the cited references for at least the same reasons as claim 1.

Applicants therefore respectfully request that the rejection of claims 1-8 and 11-16 under 35 U.S.C. § 103(a) be withdrawn.

Claims 9-10 and 17-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paul-1 in view of U.S. Patent No. 5,168,846 to Paul et al (hereafter "Paul-2"), or in the alternative, over Paul-1 in view of Yang and Paul-2. Applicant respectfully traverses.

Claims 9-10 and 17-18 depend from claim 1 and thus include all the limitations of claim 1.

As discussed above, there is no teaching or suggestion in Paul-1 or Yang of all the limitations now recited in claim 1. Adding the teachings of Paul-2 as proposed by the Examiner does not overcome the deficiencies of the other cited references.

As a result, claims 9-10 and 17-18 would not have been obvious over the cited references.

Applicant therefore respectfully requests that the rejection of claims 9-10 and 17-18 under 35 U.S.C. § 103(a) be withdrawn.

Claims 20-21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paul-1 in view of U.S. Patent No. 4,753,076 to Deutschmann et al. (hereafter "Deutschmann"), or in the alternative, over Paul-1 in view of Yang and Deutschmann. Applicant respectfully traverses.

Claims 20-21 depend from claim 1 and thus include all the limitations of claim 1.

As discussed above, there is no teaching or suggestion in Paul-1 or Yang of all the limitations now recited in claim 1. Adding the teachings of Deutschmann as proposed by the Examiner does not overcome the deficiencies of the other cited references.

As a result, claims 20-21 would not have been obvious over the cited references.

Applicant therefore respectfully requests that the rejection of claims 20-21 under 35 U.S.C. § 103(a) be withdrawn.

Claims 19 and 22-25 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Paul-1 in view of U.S. Patent No. 2,531,761 to Zucrow (hereafter

"Zucrow"), or in the alternative, over Paul-1 in view of Yang and Zucrow. Applicant respectfully traverses.

Claim 19 depends from claim 1 and thus includes all the limitations of claim 1.

As discussed above, there is no teaching or suggestion in Paul-1 or Yang of all the limitations now recited in claim 1. Adding the teachings of Zucrow as proposed by the Examiner does not overcome the deficiencies of the other cited references.

As a result, claim 19 would not have been obvious over the cited references.

Independent claim 22 recites limitations similar those in claim 1, including a first transfer volumetric device for "*sequentially transferring controlled volumes of a compressed fluid such that the pressure of said compressed fluid introduced to and exiting said first volumetric device is substantially equal*" and that "*during continuous flow of said compressed fluid from said first to each of said second volumetric devices, work is performed.*"

As discussed previously with respect to claim 1, there is no teaching or suggestion in Paul-1 or Yang of such limitations as recited in claim 22. Adding the teachings of Zucrow as proposed by the Examiner does not overcome the deficiencies of Paul-1 or Yang.

As a result, claim 22 would not have been obvious over the cited references.

Since claims 23-25 depend from claim 22 and include all the limitations of claim 22, claims 23-25 would also not have been obvious over the cited references for at least the same reasons as claim 22.

Applicant therefore respectfully requests that the rejection of claims 19 and 22-25 under 35 U.S.C. § 103(a) be withdrawn.

New Claims

New claims 28 and 29 are respectively directed to a turbofan engine system and a turbojet engine system, and both include the limitations of claim 1.

Since claims 28 and 29 include all the limitations of claim 1, claims 28 and 29 would also not have been obvious over the cited references for at least the same reasons as claim 1. Thus, claims 28 and 29 present allowable subject mater.

CONCLUSION

Applicant respectfully submits that the pending claims are in condition for allowance and notification to that effect is earnestly requested. If necessary, please charge any additional fees or credit overpayments to Deposit Account No. 502432.

If the Examiner has any questions or concerns regarding this application, please contact the undersigned at the telephone number listed below.

Respectfully submitted,

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